SUPPLEMENT for:

Wintertime Factors Affecting Contaminant Distribution in a Swine Farrowing Room

by

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This supplement provides mean exposure data, by test day, and data tables for statistical analyses discussed in the article.

Descriptive Statistics

Table S-1 provides daily contaminant averages over each of the study days, by fixed station and mapped data acquisition. Results of statistical comparisons between fan operating conditions discussed in the text are tabulated in Table S-2.

Comparison by Time of Day

This discussion supplements the tests comparing concentration by time of day, specifically by analyzing the 90-minute average data corresponding to the three periods in which contaminant mapping occurred throughout each day. These three sequential periods represent the beginning, middle, and end of the 5-hour sample day. Because concentrations were significantly different between pit-fan conditions, data were analyzed within each pit-fan operation condition (on versus off).

The adjusted Tukey tests of the least-square means (Table S-3) showed that on days when the pit fan was turned on there was a statistically significant difference between mean respirable dust concentrations of events two and three ($p<0.001$) and events one and three ($p<0.001$). However, no statistically significant difference was observed between the mean concentrations of event one and event two ($p=0.717$). An additional contrast was evaluated by grouping events one and two and comparing the two mean concentrations to the event three mean concentration, and a statistically significant difference was found ($p<0.001$). Respirable dust concentrations when the pit fan was turned off showed similar results, with mean respirable dust concentrations differing significantly between events two and three ($p=0.0003$) along with events one and three ($p=0.001$). The contrast performed by grouping events one and two mean concentrations and comparing this grouping to the event three mean concentration resulted in a statistically significant difference ($p<0.001$). Respirable dust concentrations at the end of the sample day were significantly lower than first two 90-minute events. When the pit fan was turned on, the largest decrease in respirable dust concentration from the beginning to the end of the sample day was by 87%, and when the pit fan was turned off, there was a 77% decrease in respirable dust concentration. Due to the difference in feeding time and time when the measurements started,

this change in respirable dust concentration occurred at different times over the five sample days, some days during event one and other days during event two.

Differences between event means for CO_2 were also significant for sample days when the pit fan was turned off and turned on. Event one and event two were significantly different when the pit fan was turned on ($p=0.048$) but a statistically significant difference was not observed when comparing events two and three ($p=0.963$) and comparing events one and three ($p=0.085$). A statistically significant difference was found when comparing event one mean concentration and the grouping of events two and three mean concentrations ($p=0.011$). Days when the pit fan was turned off presented differences between event means to a greater extent. Events one and two were significantly different ($p<0.001$) along with events one and three ($p<0.001$). The contrast between event one and the grouping of events two and three were also significantly different ($p<0.001$). Carbon dioxide concentrations during the last two 90-minute events were significantly higher than the beginning of the sample day with a 24% increase in CO_2 concentration across all of the fixed stations from the beginning of the day to the end of the sample day, which occurred on a day that the largest concentrations were measured. No other differences were seen between the event means for NH_3, H_2S, and CO during sample days when the pit fan was turned off and turned on.

The results of the nonparametric Kruskal-Wallis test, which does not require normally distributed data, shown in Table S-4, confirmed the results of the adjusted Tukey, which does require normally distributed data. These tests showed that there was a statistically significant difference in respirable dust concentration among the three events when the pit fan was turned on ($p<0.001$) and off ($p<0.001$). There was also a difference in CO_2 concentration among the three events when the pit fan was turned on ($p=0.027$) and turned off ($p=0.001$).

TABLE S-1. Descriptive Statistics of Daily Mean (Standard Deviation) Contaminant Concentration Over All Fixed-Area Stations and Contaminant Mapping

Day:	1	2	3	4	5	Mean	Mean	% Increase, with
Fan:	On	Off	On	Off	On	On	Off	Fan Off
Dust, mg/m^3								
Fixed Station	0.30 (0.02)	0.54 (0.06)	0.35 (0.04)	0.39 (0.03)	0.34 (0.04)	0.33	0.465	41
Mapping	0.28 (0.04)	0.52 (0.14)	0.34 (0.10)	0.40 (0.02)	0.30 (0.05)	0.307	0.46	50
CO_2, ppm								
Fixed Station	2920 (33)	3800 (160)	3050* (120)	3520 (200)	2820 (120)	2920	3660	28
Mapping	2940 (45)	4000 (430)	3090 (230)	3370 (320)	2710 (42)	2913	3685	26
NH_3, ppm								
Fixed Station	1.0 (0.6)	8.2 (4.5)	0.03 (0.05)	8.6 (1.4)	10.8 (0.7)	3.9	8.4	113
Mapping	0 (0)	1.5 (0.3)	0 (0)	0.02 (0.03)	3.6 (0.8)	1.2	0.76	-37
H_2S, ppm								
Fixed Station	0 (0)	0.28 (0.05)	0.03 (0.04)	0.67 (0.09)	0.30 (0.11)	0.11	0.48	332
Mapping	0 (0)	0.20 (0.08)	0.005 (0.006)	0.61 (0.12)	0.27 (0.11)	0.092	0.405	342
CO, ppm								
Fixed Station	1.53 (0.49)	1.00 (0.49)	1.04 (0.69)	1.23 (0.63)	0.91 (0.24)	1.16	1.12	-4
Mapping	1.30 (0.08)	1.18 (0.03)	1.18 (0.08)	1.07 (0.05)	0.95 (0.21)	1.14	1.12	-2

* Due to problems with monitor, Day 3 CO_2 fixed station mean and standard deviation has missing data from fixed station G.

TABLE S-2. Comparison of Contaminant Concentration During Sample Days When the Pit Fan Was Turned Off and Days When the Pit Fan Was Turned On

	Parametric Statistics Adjusted Tukey				Nonparametric Statistics Wilcoxon Two-sample Test	
	No Transformation		LN-Transformed			
	Mean*	*p*	Mean**	*p*	Mean Score	*p*
Dust						
Fan off	0.466	<0.001	-0.797	<0.001	73.2	<0.001
Fan on	0.329		-1.14		39.5	
CO_2						
Fan off	3661	<0.001	8.20	<0.001	47.1	<0.001
Fan on	2920		7.98		19.4	
NH_3						
Fan off	8.36	0.001	2.04	0.001	29.4	0.011
Fan on	3.92		-1.31		18.7	
H_2S						
Fan off	0.479	<0.001	-0.840	<0.001	34.1	<0.001
Fan on	0.109		-4.20		15.6	
CO						
Fan off	1.12	0.783	-0.007	0.963	22.9	0.991
Fan on	1.16		-0.016		23.0	

* Mean was computed using the least-square mean of the data that were not transformed. Units are mg/m^3 for respirable dust, ppm for all else.

** Mean was computed using the least-square mean of the ln-transformed data. Units are $ln(mg/m^3)$ for respirable dust, ln(ppm) for all else.

TABLE S-3. Comparison of the Three Ln-Transformed Event Means of Each Contaminant for Days When the Pit Fan Was Turned Off and Days When the Pit Fan Was Turned On Using an Adjusted Tukey in the Post-Hoc Analysis

	Fan On				Fan Off			
	Event	Mean*	Comparison	*p*	Event	Mean*	Comparison	*p*
Dust	1	-0.982	1 v 2	0.717	1	-0.703	1 v 2	0.939
	2	-1.02	2 v 3	<0.001	2	-0.677	2 v 3	<0.001
	3	-1.43	1 v 3	<0.001	3	-1.01	1 v 3	0.001
			1&2 v 3**	<0.001			1&2 v 3**	<0.001
CO_2	1	7.95	1 v 2	0.048	1	8.06	1 v 2	<0.001
	2	8.00	2 v 3	0.963	2	8.26	2 v 3	0.863
	3	7.99	1 v 3	0.085	3	8.28	1 v 3	<0.001
			1 v 2&3***	0.011			1 v 2&3***	<0.001
NH_3	1	-1.39	1 v 2	0.988	1	1.94	1 v 2	0.968
	2	-1.66	2 v 3	0.908	2	2.01	2 v 3	0.865
	3	-0.896	1 v 3	0.960	3	2.16	1 v 3	0.733
H_2S	1	-4.45	1 v 2	0.974	1	-0.969	1 v 2	0.760
	2	-4.18	2 v 3	0.997	2	-0.763	2 v 3	0.996
	3	-4.09	1 v 3	0.955	3	-0.789	1 v 3	0.810
CO	1	0.230	1 v 2	0.744	1	-0.027	1 v 2	0.999
	2	-0.015	2 v 3	0.736	2	-0.012	2 v 3	0.996
	3	-0.264	1 v 3	0.315	3	0.017	1 v 3	0.990

*Mean was computed using the least-square mean of the ln-transformed data. Units are ln(mg/m^3) for respirable dust and ln(ppm) for all else.

**Due to the insignificant difference between events one and two, an additional contrast analysis was performed by grouping events one and two and comparing the mean concentrations to event three's mean concentration.

***Due to the insignificant difference between events two and three, an additional contrast analysis was performed by grouping events two and three and comparing the mean concentrations to event one's mean concentration.

TABLE S-4. Comparison of the Three 90-Minute Event Means of Each Contaminant for Days When the Pit Fan Was Turned Off and Days When the Pit Fan Was Turned On Using a Nonparametric Kruskal-Wallis Test

		Fan On		Fan Off	
	Event	**Mean Score**	***p***	**Mean Score**	***p***
Dust	1	43.5		28.1	
	2	40.6	<0.001	26.1	<0.001
	3	12.0		10.2	
CO_2	1	11.9		4.62	
	2	22.4	0.027	15.9	0.001
	3	21.2		17.0	
NH_3	1	13.1		8.17	
	2	13.4	0.795	9.00	0.567
	3	15.4		11.3	
H_2S	1	13.6		7.50	
	2	13.9	0.962	10.7	0.529
	3	14.6		10.3	
CO	1	16.7		9.17	
	2	13.7	0.389	9.33	0.960
	3	11.6		10.0	